

CLAIMS

1. A semiconductor laser device comprising:
 - a first stripe structure which has at least a first active layer laminated on a part of the area of a semiconductor substrate, and a first electrode disposed on the first active layer, and which emits a first laser beam;
 - a second stripe structure which has at least a second active layer laminated on the rest of the area of the semiconductor substrate, and a second electrode disposed on the second active layer, and which emits a second laser beam; and
 - a current non-injection area which is formed on a part of the area of the upper surface of the first stripe structure and into which no injection current flows.
- 15 2. The semiconductor laser device according to claim 1 further comprising a second current non-injection area which is formed on a part of the upper surface of the second stripe structure and into which no current flows, the second current non-injection area having a surface area different from the surface area of the first non-injection area.
- 20 3. The semiconductor laser device according to claim 1 or 2, wherein the current non-injection area is formed by disposing the first electrode only on the area excluding the non-current-injection area on the upper surface of the first stripe structure.

4. The semiconductor laser device according to any one of claims 1 to 3, further comprising:

a first spacer layer disposed between the first active layer and the first electrode;

5 a second spacer layer disposed between the second active layer and the second electrode;

a first diffraction grating which is disposed on a part of the area of the first spacer layer, and which selects a first laser beam including a plurality of oscillation longitudinal modes having a specific center wavelength; and

a second diffraction grating which is disposed on a part of the area of the second spacer layer, and which selects a second laser beam including a plurality of oscillation longitudinal modes having a specific center wavelength.

15

5. The semiconductor laser device according to claim 4, wherein the first diffraction grating is disposed in an area below the current non-injection area.

20 6. A semiconductor laser device comprising:

a first stripe structure which has at least a first active layer laminated on a part of the area of a semiconductor substrate, and a first electrode disposed on the first active layer, and which emits a first laser beam; and

25 a second stripe structure which has at least a second active

layer laminated on the rest of the area of the semiconductor substrate, and a second electrode disposed on the second active layer, and which emits a second laser beam,

wherein the thermal conduction efficiency between the first
5 active layer and the first electrode differs from the thermal conduction
efficiency between the second active layer and the second electrode.

7. The semiconductor laser device according to claim 6, further
comprising:

10 a first diffraction grating disposed in the vicinity of the first active
layer such that the first laser beam has a plurality of oscillation
longitudinal modes with a specific center wavelength; and
a second diffraction grating disposed in the vicinity of the
second active layer such that the second laser beam having a plurality
15 of oscillation longitudinal modes with a specific center wavelength.

8. The semiconductor laser device according to claim 6 or 7,
wherein the width of the first stripe structure in the lateral direction and
the width of the second stripe structure in the lateral direction are
20 different from each other.

9. The semiconductor laser device according to claim 6 or 7,
wherein the distance between the first active layer and the first
electrode and the distance between the second active layer and the
25 second electrode are different from each other.

10. The semiconductor laser device according to claim 9, further comprising a first clad layer laminated between the first active layer and the first electrode, and a second clad layer laminated between the 5 second active layer and the second electrode, wherein the thickness of the first clad layer and the thickness of the second clad layer are different from each other.

11. A semiconductor laser device comprising:

10 a first stripe structure which has a first active layer deposited on a part of the area of a semiconductor substrate and a first diffraction grating disposed in the vicinity of the first active layer, and which emits a first laser beam having multiple oscillation longitudinal modes with a specific center wavelength; and

15 a second stripe structure which has a second active layer deposited on the rest of the area of the semiconductor substrate and a second diffraction grating disposed in the vicinity of the second active layer, and which emits a second laser beam having multiple oscillation longitudinal modes with a specific center wavelength,

20 wherein the center wavelength selected by the first diffraction grating and the center wavelength selected by the second diffraction grating are different from each other.

12. The semiconductor laser device according to claim 11, whereina 25 period of the first diffraction grating and a period of the second

diffraction grating are different from each other such that the center wavelength selected by the first diffraction grating and the center wavelength selected by the second diffraction grating are different from each other.

5

13. A semiconductor laser device comprising:

a first stripe structure which has a first active layer laminated on a part of the area of a semiconductor substrate and a first diffraction grating disposed in the vicinity of the first active layer that selects a first laser beam having multiple oscillation longitudinal modes and a specific center wavelength; and

a second stripe structure which has a second active layer laminated on the rest of the area of the semiconductor substrate and a second diffraction grating disposed in the vicinity of the second active layer that selects a second laser beam having multiple oscillation longitudinal modes and a specific center wavelength,

wherein a difference between the center wavelength of the first laser beam and the center wavelength of the second laser beam is not less than 0.5 times a wavelength spacing between the adjoining oscillation longitudinal modes of the first laser beam or the second laser beam.

14. The semiconductor laser device according to claim 13, wherein the difference between the center wavelength of the first laser beam

25 and the center wavelength of the second laser beam is not less than 1.5

times the wavelength spacing between the adjoining oscillation longitudinal modes of the first laser beam or the second laser beam.

15. The semiconductor laser device according to claim 13, wherein
5 the difference between the center wavelength of the first laser beam and the center wavelength of the second laser beam is not less than 5 times the wavelength spacing between the adjoining oscillation longitudinal modes of the first laser beam or the second laser beam.

10 16. A semiconductor laser device, comprising:

a first stripe structure which has a first active layer laminated on a part of the area of a semiconductor substrate and a first diffraction grating that selects a first laser beam having multiple oscillation longitudinal modes and a specific center wavelength; and

15 a second stripe structure which has a second active layer laminated on the rest of the area of the semiconductor substrate and a second diffraction grating that selects a second laser beam having multiple oscillation longitudinal modes and a specific center wavelength,

20 wherein a difference between the peak wavelength of the first laser beam and the peak wavelength of the second laser beam is not less than 0.01 nm.

17. A semiconductor laser device, comprising:

25 a first stripe structure which has a first active layer laminated on

a part of the area of a semiconductor substrate and a first diffraction grating that selects a first laser beam having multiple oscillation longitudinal modes and a specific center wavelength; and

a second stripe structure which has a second active layer

5 laminated on the rest of the area of the semiconductor substrate and a second diffraction grating that selects a second laser beam having multiple oscillation longitudinal modes and a specific center wavelength,

wherein a difference between the wavelength of all the

10 oscillation longitudinal modes having intensity not more than 3 dB below a peak power in the first laser beam and the wavelength of all the oscillation longitudinal modes having intensity not more than 3 dB below a peak power in the second laser beam, is not less than 0.01 nm.

15 18. The semiconductor laser device according to claim 17, wherein the difference is not less than 0.1 nm.

19. The semiconductor laser device according to any one of claims 11 to 18, wherein an oscillation wavelength spectrum formed by the 20 plurality of oscillation longitudinal modes that belong to the first laser beam and an oscillation wavelength spectrum formed by the plurality of oscillation longitudinal modes that belong to the second laser beam do not cross each other in a range in which the intensity difference with respect to the peak power is not more than 3 dB.

20. The semiconductor laser device according to any one of claims 11 to 19, wherein the center wavelength of the second laser beam is lower than the center wavelength of the first laser beam; and wherein a difference between a frequency corresponding to the minimum 5 wavelength of the oscillation longitudinal modes having intensity not more than 10 dB below the peak power in the first laser beam and a frequency corresponding to the maximum wavelength of the oscillation longitudinal modes having intensity not more than 10 dB below the peak power in the second laser beam is greater than an electrical frequency 10 band width of an optical transmission system being used.

21. A semiconductor laser module comprising:
a semiconductor laser device according to any one of claims 1 to 20;
15 a first lens on which the first laser beam and the second laser beam emitted from said semiconductor laser device are incident;
a polarization rotating unit on which only any one of the first laser beam and the second laser beam that have passed through said first lens is incident, and which rotates the polarization plane of the 20 incident laser beam by a predetermined angle;
a polarization-combining unit having a first port on which the first laser beam from said first lens or the polarization rotating unit is incident, a second port on which the second laser beam from the polarization rotating unit or said first lens is incident, and a third port 25 from which the first laser beam incident from said first port and the

second laser beam incident from said second port are combined and emerge; and

an optical fiber which receives the laser beams emerging from said third port of the polarization-combining unit, and which transmits
5 the received laser beams to the outside.

22. The semiconductor module according to claim 21, wherein the first lens is a single lens which separates the first laser beam and the second laser beam so as to widen a distance between the two laser
10 beams;

23. An optical fiber amplifier, comprising:
an excitation light source which uses a semiconductor laser device according to any one of claims 1 to 20, or a semiconductor laser
15 module according to claim 21 or 22;
a coupler that couples a signal light with a pump light; and
an amplification optical fiber which amplifies a light by a Raman amplification.